WamBlee

IRPT-0007

W400
Battery pre-discharge calculation

Author : Tairin Andraghetti
Under the direction of Simone Facchini
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1 Battery pre-discharge

The intent of this document is to determine the batteries lifetime connected to the W400 unit, using a pre-discharge sequence to simulate the maximum eplased battery lifetime, taking into account all the possible variables.

Due to no rules regarding battery lifetime defined in standard EN 302 961-2 (superseded EN 300 152) , the following analysis and battery discharge calculation as reported according F-E.1 & F-E.2 tables based on Cospas-Sarsat T.007 Issue 4 – Revision 7, used for approval Epirbs without GNSS module

Table F-E.1

Beacon operation modes	Mode: Manually selectable or Automatic	Measurement Interval, sec.	Average Current, mA	Peak Current, mA
OP1 – 121.5 Mhz on	Manual	60	55	180
OP2 – 121.5 Mhz on	Water sensor	60	56	180
OP3 – Self test		30	35	180
OP4 – Armed main switch[1]	-	60	0.9 * E-3	-
OP5 – OFF main switch	-	60	0	-

Table F-E.2

Characteristic	Designation	Units	Value	Notes
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	T_{CS} or TCS	years	1	
Beacon battery replacement period (from data of cell manufacturer)	T_{BR} or TBR	years	4	
Battery pack electrical configuration	3 cells DL123, serial			
Cell mode and cell chemistry	Duracell DL123A			
Nominal cell capacity		A-hrs	1.4	
Nominal battery pack capacity	C_{BN}	A-hrs	1.4	
Annual battery cell capacity loss (self-discharge) due to aging, as specified by cell manufacturer at ambient temperature.	L_{SDC}	%	0.6	
Calculate battery pack capacity loss due to self-discharge: $L_{CBN}= C_{BN} - [C_{BN} * (1-L_{SDC}/ 100)^{TBR +TCS}]$	L_{CBN}	A-hrs	0.042	
Number of self-tests per year	N_{ST}		12	
Average battery current during a self-test	I_{ST}	mA	35	
Maximum duration of self-test	T_{ST}	sec	30	
Calculate battery pack capacity loss due to self-tests during battery replacement period : $L_{ST}= I_{ST} * T_{ST} * T_{BR} * N_{ST}/3600$	L_{ST}	mA-hrs	14	
Average stand-by battery pack current	I_{SB}	mA	0.9 *E-3	1
Battery pack capacity loss due to constant operation of circuitry prior to beacon activation: $L_{ISB} = I_{SB} * T_{BR} * 8760*12/24$	L_{ISB}	mA-hrs	15.8	
Calculate value of the battery pack pre-test discharge $L_{CDC} = L_{CBN} + 1.65*(L_{ST}+L_{ISB})/1000$	L_{CDC}	A-hrs	0.091	
1 – Main switch is set in 'ARMED' position when user wear a lifejacket and is set to OFF position after activities finished. In the calculation of the battery pre-discharge, is considered main switch set in ARMED (OPE4) for 12 hours per day.				

1.1 Procedure for the assessment of battery lifetime

All operation are carried out at +20° Celsius ± 3° and 60% RH ±10% .

The battery pack is pre-discharged of the current value determined from Table F-E.2. The pre-discharge is performed with a constant current load set to a current value of 45.5 mA for a time of two hours, equivalent to 0.091A/h.

After discharged the battery pack, the battery pack is connected to the W400 unit and switch on in Alarm mode.

After switch on, a timer is started.

Every 3 hours are verified the following functional parameters of the apparatus W400, such as:

- Frequency
- Output power
- Audio tone (frequency)
- Modulation index

according limit reported on IRPT.0004, until one of these parameter goes out of limit.

1.2 Result

The W400 working for 25 hours and 22 minutes, then the unit go in malfunction conditions (working for 10-15 seconds then stop for 10 seconds and restart again the same sequence).